

Selective Postmortem Marbling in the Upper Body: A Case of Cardiac Tamponade

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We present a forensic case of a man in his late 50s who lost consciousness while driving, resulting in a low-speed (approximately 10 km/h) collision with a wall. He was found unresponsive at the scene and transported to a hospital. Despite resuscitative efforts, he was pronounced dead. A judicial autopsy was conducted 5.5 days postmortem after refrigerated storage. Externally, postmortem marbling was distinctly observed in the head, neck, and upper limbs, whereas the trunk and lower extremities remained unaffected. Internally, approximately 300 mL of hemopericardium was found due to a tear in the anterior wall of the left ventricle. Histological examination revealed acute coronary artery occlusion with intraplaque hemorrhage, indicating an ischemic origin of the myocardial rupture. This case illustrates a rare and regionally selective manifestation of decomposition, with marbling limited to the upper body. We hypothesize that venous congestion caused by cardiac tamponade created a localized microenvironment favorable to bacterial proliferation, facilitating selective marbling. Although refrigeration delays decomposition, it does not prevent it. Our findings demonstrate that antemortem circulatory conditions may influence the regional distribution of early postmortem changes, which should be considered in forensic interpretation.

Key words: postmortem marbling, cardiac tamponade, myocardial rupture, venous congestion, decomposition

INTRODUCTION

Postmortem marbling is a well-recognized phenomenon in forensic pathology, characterized by greenish-black discoloration along the subcutaneous blood vessels as decomposition progresses. This discoloration results from bacterial proliferation within the vasculature, leading to a purple to greenish discoloration [1].

In forensic practice, decomposition often begins in the lower right abdominal quadrant. This pattern is commonly mentioned in educational resources, such as StatPearls [2]. However, comprehensive research validating this regional pattern of decomposition remains lacking.

In the present report, we describe a postmortem case exhibiting marbling confined to the neck and upper body. Interestingly, despite being stored under refrigerated conditions prior to judicial autopsy, the marbling was exclusively localized to the head, neck, and upper limbs. The present case offers a valuable opportunity to explore the mechanisms underlying early and regionally selective postmortem marbling.

CASE PRESENTATION

A man in his late 50s with a history of hypertension and gout was found unresponsive in the driver's seat of his car following a low-speed collision (approximately 10 km/h) with a wall. His seatbelt was fastened, but the airbag had not deployed. He was promptly transported by emergency medical services, where resuscita-

tion efforts were attempted but ultimately unsuccessful. He was later pronounced dead. A judicial autopsy was subsequently requested at our university to investigate the cause of death. The estimated postmortem interval was 5.5 days, and the body was refrigerated at a police facility to delay decomposition until the forensic autopsy.

Externally, no considerable traumatic injuries were observed. However, postmortem marbling was observed predominantly in the neck, with a similar, although less pronounced, extent in both upper limbs (Fig. 1). No marbling was evident in the chest or abdomen, suggesting that venous congestion in the upper body may have influenced the early appearance of marbling in these areas (Fig. 2).

Approximately 300 mL of blood was noted in the pericardial sac, consistent with the findings seen in cases where cardiac tamponade is the cause of death (Fig. 3). A 3.5-cm tear extending from the apex to the anterior wall of the left ventricle was identified, which was considered the primary cause of the cardiac tamponade and subsequent fatal outcome (Fig. 4). No marked decomposition was noted in the abdominal organs, supporting the relatively early postmortem interval.

DISCUSSION

The present case describes an unusual incident of localized decomposition, with postmortem marbling confined to the cervical region. Although previous



Fig. 1 Postmortem marbling in the neck and upper limbs
The image shows the neck and both upper limbs with clearly visible post-mortem marbling.



Fig. 2 Close-up image of postmortem marbling in the neck
A close-up image of postmortem marbling in the neck, showing strong green-black discoloration along the blood vessels indicative of putrefactive changes.

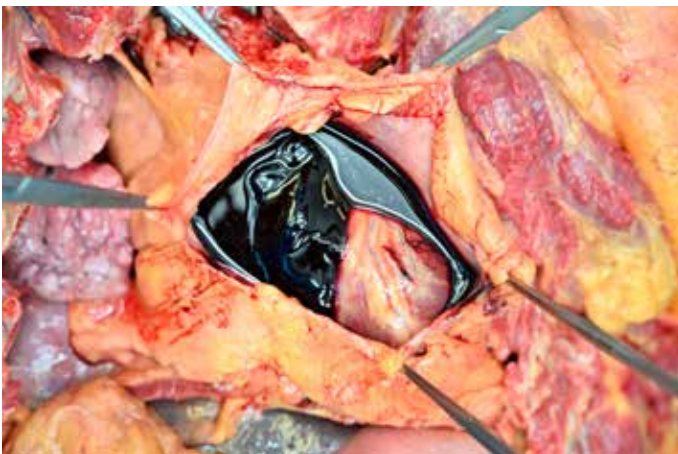


Fig. 3 Pericardial fluid accumulation in a case of cardiac tamponade
A photograph showing pericardial fluid accumulation, a hallmark of cardiac tamponade, with serous fluid visible in the pericardial sac.

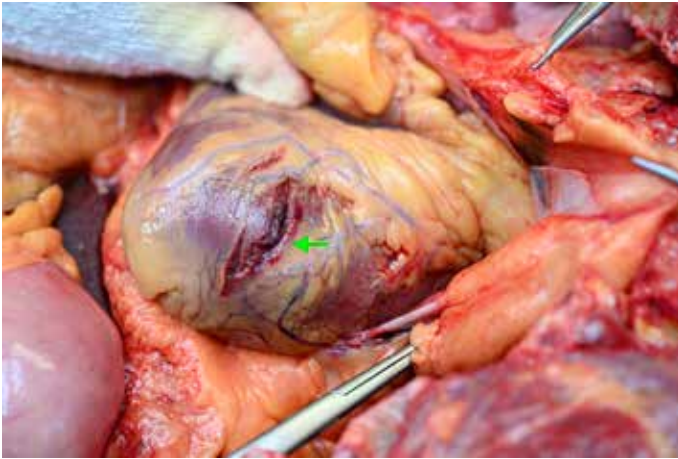


Fig. 4 Myocardial rupture on the left ventricle
A photograph showing a 3.5-cm tear on the anterior wall of the left ventricle, indicative of myocardial rupture.

reports have described regionally localized decomposition associated with infectious processes in the affected area [3, 4], reports focusing on selective postmortem marbling in the absence of localized infection appear to be extremely limited. A case-based report has suggested that localized exposure to sunlight may contribute to region-specific early marbling [5]; however, to our knowledge, the potential contribution of intrinsic disease-related pathophysiology to the selective localization of postmortem marbling has not been well documented in the literature.

Postmortem marbling refers to a greenish-black discoloration along the subcutaneous vessels, caused by bacterial activity during decomposition [1]. The marbling progression is generally influenced by intrinsic (antemortem physiology) and extrinsic factors (environmental conditions) [6].

In the present case, cardiac tamponade may have contributed to the selective development of marbling in the upper body. Cardiac tamponade is a life-threatening condition characterized by pericardial fluid accumulation, resulting in the compression of the heart [7]. It is a known complication of myocardial infarction [8, 9]. Its classic physical findings include jugular venous distension, reflecting venous congestion in the superior vena cava system [7]. We hypothesize that this venous congestion may have contributed to localized increases in blood volume and tissue hydration in the head and neck, creating a favorable environment for bacterial proliferation and early marbling in this region.

Although no direct evidence exists to confirm that venous congestion accelerates postmortem marbling, several studies provide indirect support for this hypothesis. For example, massive hemorrhage reportedly delays decomposition, likely due to a reduced supply of nutrients required for microbial growth [10]. Additionally, high water content in tissues has been associated with more rapid decomposition, as moisture facilitates microbial activity [11].

Furthermore, the body in the present case was refrigerated prior to autopsy. Although refrigeration is known to delay decomposition, several studies have reported that putrefaction still progresses slowly even at low temperatures [12, 13]. Our findings suggest that refrigeration does not halt decomposition but merely slows its progression.

Taken together, our case suggests that local venous congestion due to cardiac tamponade may have over-

ridden the inhibitory effects of refrigeration, resulting in early and selective marbling in the cervical region.

In conclusion, this case highlights the potential role of venous congestion in the early appearance of postmortem marbling, particularly in areas with increased blood volume and tissue moisture, such as the neck. Although refrigeration is generally believed to halt decomposition, our findings suggest that it merely delays putrefaction progression, rather than halting it entirely. In our case, the combination of localized venous congestion and refrigeration likely contributed to the early and selective appearance of postmortem marbling in the neck region. Future studies should explore the relationship between venous congestion and postmortem changes to improve our understanding of the dynamics of decomposition and its implications in forensic investigations.

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The authors declare no conflict of interest.

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